

## **Real Time Implementation Of Video Stabilization**

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### **Abstract**

Video captured by handheld camera like mobile, camcorder is on demand because of the ease of data transfer through different communication media. Videos are crucial when they carry information such as footage for investigation purpose, news reports, and advertising information. But many times the captured videos will be having jittery or shaky movements because of that it is unpleasant to watch. We cannot use it for investigation purpose or advertising purpose. We need to stable the video sequence. This thesis is about the real time video stabilization for the handheld cameras which having a different algorithms to compensate camera motion & implementation of those algorithm on Hardware also the comparison between software & hardware latency. This thesis also demonstrates how architecture specific optimization improves the algorithm on embedded systems such as Analog devices ADSP BF561.

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## **FPGA Implementation of a RSD based ECC Processor using Karatsuba-Ofman Method**

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### **Abstract**

Elliptic Curve Cryptography is known as an asymmetric (public-key) encryption method described on elliptic curve mathematical studies which are needed to make high speed, compact, as well as high-performance encryption-decryption keys. Elliptic Curve Cryptography produces keys using the characteristics of the elliptic curve formula as a substitute for the original technique of making the product of much bigger prime numerical values. The expertise can be based in combination with many asymmetric cryptographical techniques, like RSA as well as Diffie- Hellman. The design of an elliptic curve cryptography processor based on Redundant Signed Digit representation is considered in affine coordinates. An Arithmetic Unit is designed which firstly includes an efficient modular adder constituted by RSD adder, a modular

multiplication using the approach of Karatsuba-Ofman. A Montgomery Modular Multiplier is also considered and a Modular Division based on Binary Greatest Common Division Algorithm. While binary greatest common divisor modular division algorithm technique is implemented in most of the ECC processors in which affine coordinate frame is utilized. This algorithm is described on easy add and shifts. The complexity of this division is around  $O(2n)$ , in which  $n$  is input operand size. The point addition and point doubling are also explained. Control unit of the elliptic curve cryptography processor decides the execution flow of arithmetic unit blocks.

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## **A Unique IoT Solution for Vehicle Safety and Tracking**

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### **Abstract**

Internet of Things (IOT) is a domain that enables controlling and monitoring commonly used household and industrial devices through internet. This project aims at bringing the IoT into the automotive industry for the benefit of end user. In the present work, obtaining data such as vehicle location, speed and other tell-tales, processing and transmitting to a server is discussed and implemented. This work has been done starting right from the microcontroller level at the device to high end features, by using algorithms that use A-GPS, quick reference location, encryption, etc. Based on the project requirements, functional level system has been designed. RL-78/F14 has been chosen as the microcontroller after comparison with other RL-78 variants, NXP microcontrollers, etc. Quectel MC60 has been chosen as the GSM/GNSS module based on the criteria like support for GNSS (GPS+GLONASS), GPRS connectivity, support for TCP/IP, etc. The AT commands required for various operations were extracted from QNavigator software. Device drivers for UART, Timers, Ports and Watchdog timer were developed, verified and tested. Interrupt Service Routines were developed and verified. Also, assignment of priorities to the interrupts has been made. APIs and functions that use the developed drivers were developed. The sequences of commands of GSM/GNSS module were validated using QNavigator. Latitude, longitude and other important parameters were extracted from standard GNSS frame. A scheduler has been designed to handle asynchronous events. A schematic has been designed using suitable components. A protocol that is designed with various types of frames, data, etc. is used at both microcontroller and server side for seamless transmission of data. Communication between server having static IP address and the device has been successfully established. CAN has been successfully implemented on the connectivity module for both transmission and reception of data. Time to first fix has been optimised. Alerts via SMS for over-speeding, geo-fencing, panic button, current location and related parameters were implemented. Location comparison has been done with reference devices. Prototype system that runs on vehicle battery has been developed.

Key words: Internet of Things, Microcontroller, GNSS

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# **Smart Helmet with Bluetooth Connectivity**

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## **Abstract**

Smart Helmet uses a Bluetooth Solution of providing connectivity and comfort features to a bike rider. With Smart Phone connected to the Helmet, a rider can listen to Music, attend calls and get Navigation prompts while reaching a destination. The Helmet provides signals to other riders about his/her turn indications and Braking using lights on the Helmet. In case of an accident, the Helmet sends GPS location from Smart phone using SMS to alert a registered phone number with rider's location. The Smart phone gets connected to the rider's Helmet using Bluetooth Classic (high data rate of 2 Mbps) which is used for audio streaming and gets connects to vehicle ECU (a Hella India Automotive product) using Bluetooth Low Energy protocol (low data rate of 250 Kbps). Vehicle parameters are communicated to the Smart Phone by the ECU which provides details of turn indications, brake status and fuel level. A Smart phone application is developed which is used to exchange data between classic and low energy protocols of Bluetooth while being connected to both at the same time and has the Navigation option to use Google Map features for turn by turn Navigation and Traffic details.

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# **Content Adaptive Coding Unit Size Decision Algorithm based on Machine Learning for Intra Coding**

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## **Abstract**

High efficiency video encoding (HEVC or H.265), the recent worldwide video encoding standard, shows a 50% decrease in bit rate with roughly equal quality and drastically higher encoding complexity as opposed to nature and H.264. The quadtree partition of the coding unit (CU) expends a enormous amount of the HEVC encoding complexity in HEVC due to the brute force search algorithm for rate distortion optimization (RDO). Unlike other fast algorithms, we initially suggested an algorithm of a deep learning approach to predict the computational complexity of the CU partition based on convolutionary neural network (CNN) intra-mode HEVC. First, we set up a broad database with various patterns of CTU partitions. This database

is one of the research domain's ordinary HEVC YUV format file. This enables for profound learning on the CU's intra-mode partition by skipping the RDO's normal computational process and using the early terminated hierarchicalCNN (ETH-CNN) to divide the CU. Secondly, we represent the CU partition of an entire coding tree unit in the form of a hierarchical CU partition map (HCPM). Then we propose that an ETH-CNN be studied to predict HCPM. The encoding complexity of intra-mode HEVC can therefore be drastically reduced by replacing the brute-force search with ETH-CNN to determine the partition of the CU. Then, the ETH-CNN predicts the CU partition to decrease the complexity of the HEVC intra-mode. Finally, experimental results show that our approach outperforms other state-of-the-art techniques in reducing complexity of intramodal HEVC. In terms of PSNR and bitrate, the results are contrasted in terms of QP values.

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## **Instruction Set Design Using XtensaTensilica**

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### **Abstract**

Many researchers have proposed implementation of Rough Set Theory on hardware level but not all of them have build a hardware level instruction set for it. Rough set algorithms have been showing their importance in fields of knowledge extraction, data mining, decision making, pattern recognition, image processing, etc. In this paper we have used Tensilica Xtensa an extensible processor to have specialized instruction to calculate elementary set and crisp set. Having a instruction set at hardware level can save time and energy. In this project we have constructed instruction set for elementary set and crisp set with four attributes of 32-bit each (128-bits) and an object of 32-bit, on base processor of "tie-dev1" with 5-stage and 7-stage pipeline.

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## **AIS140 Compliant Solution for Driver Behaviour Analysis and Trip Analytics using Cloud Platform**

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### **Abstract**

AIS (Automotive Industry Standard) 140 complaints TCU along with cloud connectivity will be mandate in India soon for Commercial Vehicles. Moreover, in India, growing car buyers are demanding affordable luxury and connectivity solutions. Various vehicle data such as speed,

vehicle location, ignition status etc. can be transmitted to the cloud platform. On cloud, operation such as data analysis, machine learning can be applied and monetary solutions such as Driver behavior analytics, Trip analytics, Geo-fencing, Firmware updates over the air, Predictive Maintenance etc. can be provided to the end users. The telematics control unit having the ability to connect to the cloud platform can obtain the vehicle data from various ECU's present in the vehicle over the CAN bus. Using data from various vehicle ECU's, along with an external 3rd party AIS 140 standard compliant telematics connectivity unit can be used to transfer data on cloud thereby providing above mentioned services. The possibility of providing the ECU's as a 'Product + Service' can be explored.

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## **A Power and Static Noise Margin Analysis of different SRAM cells at 180nm Technology**

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### **Abstract**

Aggressive technology scaling in semiconductor devices has resulted in stabilitydegradation of classic SRAM designs. It becomes problematic for very large circuit that includes Memory. The stability of SRAM cells can be affected by noise during a read operation and radiation during the standby mode. In This work, we analyze the different SRAM cells 6T, 8T, 9T and 10T SRAM cells .Leakage power consumption is also one of the primary concern in nanotechnology Era as number of transistor keeps on increasing and threshold voltage is decreasing. We analyze static noise margin (SNM) and leakage power at different Temperature and Power supply for all four structure.Simulation are done on cadence virtuoso Tool. The Result shows that 9T SRAM cell have better performance, power consumption and static noise margin compared to other three structures. According to results 9T cell has at least 20% less leakage Power with respect to 10T SRAM cell and have 150% increased static noise margin over conventional 6T SRAM cell.

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## **Driver Assistance System using Projection based Head-up Display**

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**Abstract**

Driver distractions from road for checking navigation, mobile notifications information is main concern which we tried to address. We demonstrate implementation of Driver assistance system using projection-based Head-up display. This system involves projection of information related to Navigation, Vital parameters of vehicle and mobile notifications directly in front of driver's eyes which will reduce driver's distraction. Proposed system allows driver to check vital information without losing direct sight of road. Implementation of navigation assistance done with help of google cloud based google maps APIs and live location from GPS. Vital parameters of vehicle were taken from standard OBDII port. Developed android application for accessing mobile notifications and passing it to Head-up Display over Bluetooth. Driver gets navigation information and mobile notifications directly in line of sight of road. Thus, driver does not need to check mobile every time. This demonstrated system provides better driving experience by assisting driver and increases safety for driving.

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## **SV-UVM based Ethernet MAC UVC Development**

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**Abstract**

In this project, Ethernet MAC Protocol developed by using SV-UVM UniversalVerification Component(UVC) Recently, Ethernet MAC has become popular in the industry so verification of Ethernet MAC is important. Hence Universal Verification Component uses UVM Environment for verifying the functionality of the Ethernet MAC protocol. More than 70 percent of the total time is consumed by verification. So, it is important to construct a reusable and robust verification environment. Traditional methods are not efficient for complex systems. This project provides a UVC for Ethernet MAC. According to the Ethernet frame format, the frame fields generated and that frame fields are sent on 10 Gigabit Media Independent Interface(XGMII) of 10 Gbps Ethernet MAC. Thus this project creates a soft IP (UVC) to verify Ethernet MAC Protocol on anySoC. This UVC can be reused in different applications for verification of IP. Thus here we have designed a dedicated UVC for verifying other IP using UVM which improves the test coverage and reused in the verification environment.

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# **Implementation of LEM2 algorithm on FPGA**

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## **Abstract**

Rough Set Theory (RST), proposed by Z Pawlak, is a new mathematical model for uncertain data. Tools based on RST are mainly useful for data mining tasks such as classification and rule mining. Rule Induction is part of Machine learning in which the rules are extracted from set of observations. Rules generation always have important role in data mining and provide some connection between attributes which are helpful for decision making. A problem for conventional rule algorithms is that there are too many rules generated which are very difficult to analyze. This report proposes a rough set-based approach to generate rules from a consistent information system. The preprocessed data collected from LA (Lower Approximation) and UA (Upper Approximation) concepts. The report includes implementation of LEM2 algorithm for different count of conditional attributes considering sixteen cases or objects. By increasing conditional attributes in our design, the circuit is affected by increasing LUT utilization, increasing register count, increasing Power, decreasing speed, increasing Area and increasing gate count also.

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# **Design and Development of UVC for AXI-Lite Protocol**

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## **Abstract**

AXI-Lite Bus Protocol is widely used for interconnection of various modules of System On Chip. As being an advance protocol it is composed of many parallel operations which make a system complex. It is important to construct a reusable and robust verification environment to verify such complex and parallel operations. Approximately 70 percent of design cycles are spent on verification. Traditional methods of verification are not efficient for complex systems. It requires a matured verification methodology. Universal Verification methodology is a promising solution. It provides well constructed, reusable SystemVerilog based Verification environment. This project provides a UVM Verification Component(UVC) for AXI-Lite. Where entire Verification Environment is built with multiple UVCs as the primary building blocks. The basic concept behind the project is to provide UVC for AXI-lite Protocol which contains UVC for AXI-Lite Master and UVC for AXI-Lite Slave. According to the component to be verified, UVC can be selected in the UVM environment. Multiple instances of Master and Slave UVCs can be generated to visualize complete system environment. Multiple master multiple slave Structure

provides re-usability of the code. In this project, the entire verification environment is built. Various testcases are applied to it and results are analyzed.

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## **Autonomous electrical three-wheeler development to drive on a predefined path: Camera based Image processing and computer vision system development**

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### **Abstract**

As per the report of road safety many people die each year in roadway departure crashes caused by driver inattention while driving on road. Computer vision based autonomous vehicle systems are useful in avoiding these accidents as safety is the main purpose of these systems. Such systems have the goal to detect the lane marks, other vehicles, pedestrians, and other objects, to warn the driver in case the vehicle has a tendency to get into accident. This system is an important element of many intelligent transport systems. Computer vision in autonomous vehicle is a challenging task because of the varying road conditions that one can come across while driving. In the past few years, numerous approaches for computer vision-based detection were proposed and successfully demonstrated. In this paper, a comprehensive review of the literature in computer vision-based detection techniques is presented. The main objective of this paper is to discover the limitations of the existing lane and objects detection methods and come up with the new and efficient techniques which will help to use the algorithms in real time.

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## **Improving Intra Prediction In High Efficient Video Coding Standard**

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### **Abstract**

In the modern era popularity of video applications is increasing rapidly. Digital video is the future of the internet and communication. Study shows that 80 percentage of traffic on the network is due to the the video, so there is need reduce the network traffic.High Efficient Video

Coding is a video coding standard used to achieve high efficiency. It gives approximately 50 percentage more efficiency as compared to previous video coding standard. Intra prediction is an important part of high efficient video coding. Intra Prediction is used in High efficient video coding to reduce spatial redundancy. In intra prediction reference pixel is used to predict pixel in coding block to reduce spatial redundancy. High Efficient video coding (H.265) video coding standard uses copying-based method for intra prediction. Copying based method can be further improved to make better prediction block. This paper plays out the theoretical analysis of the intra prediction block by assuming the first order Gaussian Markov model as a reference. This analysis shows that when pixel is away from the reference pixel then prediction weights should be small similarly when deviation level is more then also the prediction weight should be small. To achieve above requirements we have to apply optimal prediction weights instead of copying based prediction weights. For this we need to store all the optimal prediction weights. But this is not possible to store large volume of data. To solve above problem multiple time smoothing filter is applied. The prediction block is convolved with smoothing filter. This paper proposes improved copying based method to derive better prediction block. Both theoretical and experimental analysis shows the proposed method is more efficient than conventional copying based intra prediction method.

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## **Localization of Steady Sound Source and Direction Detection of Moving Sound Source**

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### **Abstract**

A convolutional neural network (CNN) based classification method for broadband direction of arrival (DOA) estimation of steady sound source in noisy conditions and also in reverberation conditions using a uniform linear array (ULA) of microphones. In addition, we also find out the direction of moving sound source (left or right), where the phase component of the short-time Fourier transform coefficients of the received microphone signals are directly fed into the CNN and the features required for DOA estimation are learned during training. Since only the phase component of the input is used, the CNN can be trained with synthesized noise signals, thereby making the preparation of the training data set easier compared to using speech signals. Through experimental evaluation, the ability of the proposed noise trained CNN framework to generalize to speech sources is demonstrated. In addition, the robustness of the system to noise, small perturbations in microphone positions, as well as its ability to adapt to different acoustic conditions is investigated using experiments with simulated and real data.

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# **Delay and Power Analysis of Current and Voltage Sense Amplifiers for SRAM at 180nm Technology**

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## **Abstract**

In CMOS memories sense amplifier plays a very vital role. It is mostly used in a cache memory to speed up the memory read operation. The performance of sense amplifier mainly affects both memory access time and overall memory power consumption. A simple analysis indicates that the speed enhancements are possible by using current mode than voltage mode signal transporting technique. The significance of this approach is to use low resistance current signal circuits to lower the impedance level and voltage swing on long interconnect wire. Simulation results are given regarding the delay for different power supply voltages V<sub>dd</sub> and for different values of bit line capacitances. Simulation results of static power and total power consumption for different values of V<sub>dd</sub> are analyzed.

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